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# RADIUM

EDITED BY

CHARLES H. VIOL, Ph. D.

AND

WILLIAM H. CAMERON, M. D.

VOL. XVI

MARCH, 1921

No. 6

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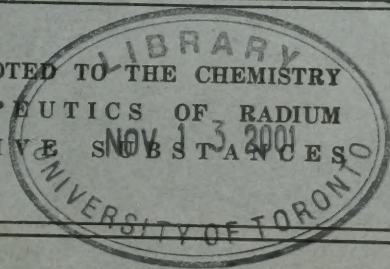
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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY  
PHYSICS AND THERAPEUTICS OF RADIUM  
AND RADIO-ACTIVE SUBSTANCES





# RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND  
THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

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Edited by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of  
collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. XVI

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## DR. HENRY H. JANEWAY

Dr. Henry H. Janeway was born in New Brunswick, New Jersey, March 19th, 1873, and died at his home in Riverdale-on-Hudson, February 1st, 1921. Educated in the Rutgers Preparatory School and graduated from Rutgers College in 1889. A post-graduate course in Sheffield School, Yale University under Professor Chittenden. Then followed four years in the College of Physicians and Surgeons, Columbia University, after which (1898) he entered Roosevelt Hospital in the surgical division under Charles McBurney. He studied in the clinics of Roosevelt, Skin and Cancer and Lying-in Hospitals. His first five years were given to general practice in New Brunswick, New Jersey. In 1907 he became associated with his father-in-law, Dr. Bulkley, in his dermatological practice. He remained with him for two years, and during that time made extensive investigations in skin and cancer pathology and wrote several articles upon this subject. In 1909 he was appointed chief of the Laboratory for Experimental Research of Physicians and Surgeons. He did special work in blood-pressure, shock and in surgery of the oesophagus and stomach. In 1914 he was appointed Attending Surgeon and Chief of the Radium Department at Memorial Hospital, New York City, where he developed and advanced the use of radium as a therapeutic agent. Dr. Janeway's work with radium in uterine cancer was most notable. He was the first man in this country to advocate radium as the agent of choice in cervical carcinoma; the technic of burying radium emanation in the cervix was original with him and, in fact, all his work with radium emanation needles was primarily original. His work on conservative surgery plus radium was early recognized. Various procedures, such as the use of dental-modeling compound for improving technique in applying radium, originated in his clinic. Dr. Janeway's clinical and experimental observations have been presented in many very excellent articles which have appeared from time to time in the leading medical journals. His report on Radium Therapy in Cancer, at the Memorial Hospital (1915-1916), which ap-

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peared in book form in 1917 was the most comprehensive work of its sort published in this country. Dr. Janeway's paper on "The Treatment of Uterine Carcinoma" (Surg. Gynec. & Obst. xxix, 242-265 Sept. 1919) is a classic.



HENRY HARRINGTON JANEWAY, M.D.

March 19, 1873—February 1, 1921

Dr. Janeway's pioneer work, his unselfishness and his optimism made his clinic the Mecca for radium workers. His example inspired his fellow workers and they will without doubt carry out his plans and continue the good work he began at Memorial Hospital.

**REVIEWS AND ABSTRACTS**

John G. Clark, M.D. (Philadelphia). The Relative Values of Radium and Surgery in the Treatment of Tumors of the Pelvic Organs. *Annals of Surgery*, lxxi, 683-696, June, 1920. Annual oration before the Philadelphia Academy of Surgery, delivered March 1st, 1920.

"The logically developed principles underlying the modern operations for myoma uteri with their large life-giving and health-restoring factors, and a percentage, though small, of cures after a radical operation for cancer of the cervix and the large salvage after hysterectomy for cancer of the fundus, place these surgical procedures upon a plane of efficiency that commands our admiration. Just as old wine requires no bush, so a perfect method which yields faultless results may stand without support as the product of a perfected art or science. The choice of my title, therefore, has been made with the intent of forestalling any suggestion of surgical nihilism, for I am convinced, as the result of five years' experience in the use of radium, that we may consider it as an adjunct of surgery and not its competitor. The fact, however, that radium has worked so well in certain types of myoma uteri and has rendered so much easier the life of patients afflicted with incurable cancer, and further, that among these cases it has a definite percentage of survivors to its credit over the three-year period, with two individuals who have passed the quinquennial test, makes its unnecessary to offer an apology for making this novel form of therapy the subject of this address. In other words, our experience is such as to sustain the belief that in this instance the vintage of the modern surgical wine, although excellent, does occasionally require fortification; for this remedy is a most effective surgical coefficient, which, however, does not supplant surgical intervention but merely aids us in developing a well-balanced judgment in the selection of those cases best fitted for the more radical measures and those adapted to the safer and easier therapy."

"The results in cancer of the uterus from the most radical operation, when we consider the small percentage of operability and the very high ratio of recurrence, will not stimulate a very antagonistic discussion against any substitute which may offer encouragement for relief or possible cure of that large proportion of cases which fall within hopeless bounds so far as direct surgical intervention is concerned. On the other hand, as the proceedings of our various national societies attest, very strenuous opposition has arisen against radiation in myoma uteri. To the surgical enthusiast, this opposition is apparently well based, for during the last two decades the evolution of the operative treatment of this class of tumors has reached a plane of such scientific precision as to furnish the liveliest satisfaction, for the operations are attended by an exceedingly low mortality, and furnish a very large percentage of absolute cures and a small morbid residue. Our own experience in the Gynecological Department of the University Hospital very satisfactorily justifies our confidence in surgical intervention, for in our last series of 100 cases of myoma, in which hysterectomy has been performed during the last fifteen months, there was but 2 per cent. mortality, but notwithstanding this satisfactory issue, during that same interval, 110 cases have been radiated without mortality and almost without morbidity. We do not set one series of cases in antagonism to the other, but view both with equal satisfaction. The first represented the more hazardous risks, for it includes the large tumors and those associated with coincident inflam-

matory or other pathological lesions, whereas the second series comprise chiefly the small tumors causing hemorrhage and those cases of myopathic hemorrhage which in previous years have been subject to hysterectomy. To bring this question into clearer light for discussion, I shall consider, first, the use of radium in myoma uteri."

*"Myoma Uteri.*—In the study of myomatous tumors, both in the consulting room, in the laboratory, and in the operating room, it has been fully attested that the symptomless tumor may remain quite innocuous over an indefinite period and finally after the menopause cease to be even a tentative menace, but the percentage of such cases is really very small in the final clinical summary of these cases. First, as to the various changes and degeneration which may take place in the tumor itself. Of these, the malignant change has probably been chiefly stressed as an argument in favor of attacking all growths of this nature as soon as diagnosed. That this fear has been enormously magnified has been proved in the study of over 850 cases in the gynecological laboratory by my associate, Dr. Charles C. Norris. A small ratio, not greater than 4 per cent., of cancer of the fundus may be found among myomatous uteri, but it is seldom, indeed, that these cases are not diagnosticated with great assurance on first consultation before even a curettage is performed."

"A myomatous tumor is a constructive growth, merely building up in a disorderly fashion the normal muscular and fibrous tissues of the uterus. Consequently, so far as uterine bleeding is concerned, and this is the chief symptom upon which we rest our diagnosis of benignancy, it follows the normal physiologic law of periodicity. Therefore, when the normal menstrual flow is converted into a menorrhagia, even though stretched over several days, with clean-cut intermenstrual intervals of no bleeding or discharge, the clinical assumption in favor of benignancy is almost positive. On the other hand, cancer of the cervix or fundus is not of a constructive type of growth, and in creating its hemorrhagic symptoms deviates at once from the law of periodicity and begins to cause intermenstrual spotting, which very soon merges into a continuous flow with only the ebb and flood tide of the menstrual waves increasing and decreasing its output."

"Almost with unerring precision, therefore, one may rule out cancer of the fundus except, in the earliest possible case through this interpretation of menstrual symptomatology. Menorrhagia is the hall mark of a myoma, regardless of its excess, whereas the tiny spot of intermenstrual blood is always a danger signal of cancer never to be considered carelessly. The criticism, therefore, that in treating myomata with radium, one may overlook cancer is not based upon clinical facts. Further, this error may be checked accurately by the diagnostic curettage, which should invariably take place in every case in which there is the slightest suspicion of this complication. Should the pathologic report show the presence of a coincident cancer of the fundus, a hysterectomy may be performed before the patient leaves the hospital. In such an event, the use of radium does not prejudice either the immediate surgical or remote curative result, for it has struck a very effective blow against the cancer, which combats its further distribution through metastasis, and especially serves when the hysterectomy is performed as a splendid prophylactic agent against the implantation of actively growing cells in the freshly exposed tissues. In its action, radium strikes immediately and effectively all carcinomatous cells within its radius and like stricken plants which may not wither for a few days are, neverthe-

less, rendered incapable of further growth or propagation."

"Through selective differentiation as controlled by our laboratory findings in myomatous tumors, we are much more concerned by one or two of the benign retrogressive changes in myomata in their relations to radium therapy than by the malignant changes which may certainly be recognized and properly dealt with. A simple liquefaction process, or hyalin change, may be taken care of very satisfactorily by gradual absorption; a true necrosis, however, gives rise to toxic by-products, which seriously influence the patient's health."

"One not infrequently finds in certain myomatous cases a degree of anæmia not balanced for by the loss of blood, the patient's complexion appearing more like that of cachexia than that which occurs in an uncomplicated anæmia; and furthermore, there is an asthenia of a toxic type which is not satisfactorily accounted for by a simple blood loss. Seldom, indeed, in such instances is a malignant condition encountered, but not infrequently varying stages of degeneration of the tumors are discovered on macroscopic section marked by a grayish-purple or slaty discoloration or actual gangrene in some of the tumors, indicating a partial or complete necrosis. In others an extensive liquefaction necrosis is noted. Through the absorption of these necrotic or degenerating materials, serious inroads on the patient's constitution have occurred and a rapid healthful rebound follows a hysteromyomectomy. Based on these observations, we cannot look with favor on the conversion of large tumors through radiation into retrogressive tissues, which through absorption may cause toxic symptoms, hence our limitation based upon the smaller sizes of the tumors has been established. When the tumor is large, as we have hitherto noted, the patient may serve as the sarcophagus for her decadent tumor. Also, these large tumors are very frequently associated with or, through pressure, have produced other lesions, especially of the inflammatory class. Frequently pressure symptoms have forced the patient to consult the surgeon, and there may be no variation of the menses from the normal. In such cases the tumor may be a pure fibroid, largely of a dense hyaline or calcareous type, certainly not quickly responsive to radiation."

"For these, and still other reasons, therefore, we find no evidence thus far in our experience to convince us that the large tumors should not be removed by approved surgical methods. In no instance has there been so quick a decrease in the size of even the smaller tumors as to justify us in believing that the larger tumors which are giving pressure symptoms will diminish sufficiently rapidly in even six months or a year to give satisfactory relief. We stand, therefore, on the general principle against radiation in tumors larger than a three or four months' pregnancy, and in only the exceptional case do we deviate from this rule."

"The next danger—that of sarcomatous transformation of the myoma—is also stressed with much gravity by many writers, but the cold laboratory records very greatly chill this side of the discussion. The fact is that sarcoma is seldom a degenerative or concomitant evil of myoma. If it were as common as is asserted by some of these alarmists, out of every series of 100 supravaginal hysterectomies, as usually performed by American surgeons, a definite percentage of recurrent sarcomas in the cervical stump should be encountered. In more than 1,000 hysterectomies performed in the Gynecologic Department of the University Hospital such a sequel of a supravaginal hysterectomy has

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been observed but once. In a review of 816 myomas in our laboratory by my associate, Dr. Charles C. Norris, he finds 25 sarcomas, only 13 of which were not diagnosed clinically at the time of operation. Based both on clinical and on laboratory conclusions, therefore, we deal with fears solely within the domain of fallacious supposition in discussing the dangers of sarcomatous changes in myomas and fibromas. Even were these fears justified in a much larger measure, there would still be no argument against the use of radium, since these tumors react most favorably to this influence."

"Through an experience with nearly two hundred cases, including myomata chiefly and a smaller number of myopathic hemorrhage, we have established for ourselves a very definite rule of elective procedure. As to the cases which we do not radiate, we may classify them as follows:

"1. The larger tumors; as measured by the size of the pregnant uterus, the maximum being that of a three or four months' pregnancy. There are a few exceptions to this rule as marked ordinarily by decided surgical contraindications, such as grave heart lesions, greatly diminished renal function, and other serious constitutional defects which ordinarily render an operation unduly hazardous."

"2. All tumors with symptoms of associated inflammatory lesions, indicated chiefly by unilateral or bilateral pain. This contraindication to radiation is based upon the fact that old inflammatory lesions may be stimulated into renewed and dangerous activity. In three or four instances, this distressing complication has followed radiation in these cases."

"3. In patients with normal or slightly increased menstruation who present a cachectic appearance and are the subjects of toxic symptoms out of proportion to their anaemia."

"4. In all cases in which there are symptoms of other coexistent abdominal lesions, such as cholecystitis, cholelithiasis, appendicitis, etc."

"With these four classes still held within the surgical domain, we treat only the tumors of smaller sizes, causing hemorrhage as their chief symptom, and all casts of myopathic hemorrhage. Of all patients, the latter respond most quickly and satisfactorily to this remedy. Under the limitations just enumerated, we may with the greatest assurance predict a very satisfactory course for cases falling within the restricted domain. The great advantage of this plan of treatment over either x-ray treatment or major surgical operations is its simplicity and safety. The patient undergoes the simple preparation incident to a curettage. Nitrous oxide anaesthesia is administered, the cervix is well dilated, the uterus curetted if there are symptoms of possible malignant change, and fifty milligrams of radium introduced according to the method described in other papers hitherto published. The use of an anaesthetic makes more accurate the diagnosis and safer the application. The subsequent events in the recovery of the case follow with clock-like regularity; five days in the hospital, about six weeks of variability as to the flow, in some this symptom may persist or even temporarily be excessive, in others ceasing abruptly, never to recur. After the hemorrhagic phase is over, there is a brief period, as a rule not over ten weeks from the time of radiation, of a slight sticky yellowish vaginal discharge, seldom profuse and never offensive. This concludes the symptomatology as it relates to the uterus after radiation."

*"Menopause.*—The change of life in these cases varies in its phases, as the constitutional and temperamental characteristics of women vary. In this connection one might employ the lines of the comic opera librettist: "There are never two women alike, and never one woman alike twice." In the more marked grades of anæmia we believe the climacteric change is more abrupt and attended with more pronounced symptoms. This may be explained on the theory that the hematogenous system has been working for weeks or months at a great speed in corpuscular generation, since the continuous loss of blood is so great that this excessive deficit must constantly be remedied. A quick check on this great activity must in many instances jar the physiologic equilibrium and thus induce a more acute menopause. So far as we are able to judge, we believe that the menopause is somewhat more trying to the average woman under an abrupt cessation than when she drifts into this change more naturally. In estimating the possible objections to radiation this symptom may possibly be classed in this light, although it in no way differs from the same sequel after a hysterectomy in which the ovaries are removed. In general, we find our patients are very enthusiastic over their results, and count this possibly trying symptom as of light moment compared with their satisfaction over an escape from an operation."

*"Failure to Relieve.*—Of our series of over 150 cases, we have failed to relieve four patients sufficiently to satisfy them or ourselves, and we have subsequently resorted to a hysterectomy. Two patients have been operated upon in other clinics. So far as we have seen, no disadvantage has occurred from the preliminary radiation, as all of the patients except one upon whom an operation has been performed have recovered without complications."

"The course of events just depicted is that noted in women nearing or in the menopausal years. In younger women, we employ radium much less frequently than we operate, because these cases may be eligible for a simple myomectomy or a subtotal hysterectomy, which leaves the generative organs essentially normal in the first class, and there is a more stable physiologic equilibrium after an operation in the second. When we resort to radium in younger individuals, it is never employed in maximum dosage, but is started at a low point of intensity free from the danger of bringing on the climacterium. It may, therefore, require a second and possibly a slightly stronger dosage to check an excessive flow. In younger patients we study with particular care the symptomatology and its underlying pathology, for there is just as much danger in these individuals from the unbridled use of radium as that following the heedless surgery of the overzealous or injudicious ovariologist. As a concluding comment upon this aspect of radiation, we may express the greatest enthusiasm as to the results obtained in a large series of cases, now over 200. Time is proving the cures permanent and free from any sequelæ, which in their later phases might stand prejudicially against the treatment."

*"Cancer of the Uterus.*—From the beginning of our use of radium in the Gynecological Department of the University Hospital in 1914 up to January, 1919, over one year ago, when our last summary was made by Doctor Keene and myself, we had treated 209 inoperable cases of cancer of the uterus with the following results:

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|                                                  | Dead | Not Traced | Living |
|--------------------------------------------------|------|------------|--------|
| 1914 .....                                       | 8    | 0          | 1      |
| 1915 .....                                       | 19   | 1          | 4      |
| 1916 .....                                       | 46   | 8          | 11     |
| 1917 .....                                       | 33   | 3          | 23     |
| 1918 .....                                       | 5    | 13         | 34     |
| Total .....                                      | III  | 25         | 73     |
| Hemorrhage .....                                 |      |            | 209    |
| Stopped .....                                    |      |            | 132    |
| Lessened .....                                   |      |            | 26     |
| Uninfluenced .....                               |      |            | 13     |
| Not stated .....                                 |      |            | 38     |
| Leucorrhœa .....                                 |      |            | 209    |
| Stopped .....                                    |      |            | 85     |
| Lessened .....                                   |      |            | 26     |
| Uninfluenced .....                               |      |            | 28     |
| Increased .....                                  |      |            | 14     |
| Not stated .....                                 |      |            | 56     |
| Pain .....                                       |      |            | 209    |
| Relief .....                                     |      |            | 49     |
| Unrelieved .....                                 |      |            | 34     |
| Lessened .....                                   |      |            | 8      |
| Pain not present at time of first radiation..... |      |            | 118    |

"No cases treated within one year before this tabulation have been enumerated, as we are now looking towards the ultimate rather than immediate results. Since the above tabulation was made at least two of the patients treated in 1915 have gone over the five year period and are living and free from recurrence."

"We regret that we are unable at this stage of our report to give a more complete summary as the number of patients not traced is accounted for by the facts incident to war—first, the decreased number of our hospital staff rendering it impossible to keep our follow-up system abreast of the times. Further, the nomadic tendency of an urban population, due to the recent fluctuation of our industrial systems and the disturbance incident to the housing situation, makes it exceedingly difficult to keep track of a continuously mobilizing population. In endeavoring to trace our patients we have found not infrequently a change of three or more addresses within a few months after their discharge from the hospital. Notwithstanding these discrepancies in our reports, the showing in this series is rather remarkable, and we have been greatly encouraged to find so large a number of patients, all of whom fell within the inoperable class, still living and apparently well many months subsequent to their last treatment. Some of these cures have been startling, and we are now justified in our hopeful forecasts for a few permanent cures and we know beyond cavil that the palliative results have been far and away better than that following any therapeutic measure hitherto employed. In reviewing our results from radium therapy, we find that same bizarre tendency as noted in our previous surgical experience with cancer. From the appearance or even the extent of the disease no one

can forecast with assurance the probable outcome of treatment. When surgical measures are invoked, one frequently ends an operation with a great degree of optimism as to a cure, because the disease has apparently been well circumscribed and has shown no demonstrable metastasis, and yet within a few months has again appeared with renewed violence at the local site of operation, while in another case in which the frontier zone of the growth has not satisfactorily been encompassed and the prognosis is bad, the patient may remain free a long time from recurrence or even may be cured. This same peculiarity has been noted in our radium experience. Thus in our 9 cases treated in 1914, the one living patient discredited every forecast and survives today and is to all appearances cured despite a very extensive and a very vicious type of cancer. A young woman under thirty years of age was taken into one of our hospitals in almost a moribund state from a massive intraperitoneal hemorrhage, incident to a large perforation of the fundus of the uterus from a decidoma malignum. The surgeon was compelled because of the critical state of the patient to perform a rapid supravaginal hysterectomy. Her convalescence was slow and she left the hospital in a very precarious condition, and was again readmitted six weeks later almost ensanguinated from a massive vaginal hemorrhage. On examination, a large fixed mass was found in the left side of the pelvis and a deep irregular crater occupied the site of the cervix. A hasty cauterization was done to save her life. Notwithstanding the hopeless outlook, two applications of 100 milligrams of radium were made at a six weeks' interval. After the first radiation the bleeding ceased and her recovery was nothing less than astounding. This patient has passed her five-year period and is now well and actively engaged in her household duties and has adopted a child. A very brilliant argument could be constructed in favor of radium were we to let this case occupy the center of the limelight, but surgery has just as remarkable instances of unexpected cures when the issue appeared as hopeless and we must, therefore, turn to a summary of all cases in order to find a judicial equilibrium. In these startling cases, however, we feel that there may be further pointers towards still better results. Possibly through the use of radium or its emanation carried into the depths of a growth a further advance may be made. At least these remarkable cases furnish a further sustaining argument in favor of the cure of cancer so long as the process is still localized and without metastasis when it is attacked either by surgical means or radium."

"Other cases in our series are equally noteworthy, but it is not our purpose to lay great stress upon these highly gratifying isolated instances, but to base our discussion upon the influence of radium in those patients who are not healed. Time will soon establish the question of final cures. In the meantime we feel that a very important advance has been made in the palliative treatment of even the hopeless cases. Thus, in our large series, hemorrhage has been stopped for a considerable period in a very large percentage, in many never returning, in others reappearing at variable periods before the death of the patient. In others it has been notably lessened and but seldom not influenced. No argument is required to sustain this beneficent palliation in these fear-stricken women, for to those who witness this relief the results are self-evident. The malodorous discharges are likewise blotted out in a considerable proportion of cases. In its palliative influence on pain we cannot claim so much, and yet it frequently acts most happily in this direction. In radium cases, as in surgery, however, we must meet the same

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lay criticism as well as professional pessimism in those instances in which pain is not relieved after radiation or comes on later in the course of the inoperable case. Frequently, this acute terminal agony is charged up to the account of radiation by relatives or friends of the patient and occasionally this same objection to the use of this novel remedy is sustained by the family physician. Every surgeon knows that surgery is likewise condemned under the same conditions. In all propaganda work, therefore, among laymen as well as within our professional circle, the fact should be dwelt upon that while cancer in its earlier stages is always painless, in its terminal stages it is nearly always agonizing. In only this way may these false assumptions be overcome concerning any remedy which fails."

"In the occasional case in our series in which the pain has been especially severe, we have felt that possibly there might be a decided suspicion in favor of this hypothesis and yet within a few days another case may be seen with identical symptoms in which no treatment whatever has been applied. Even admitting this possibility in the occasional case, the many others which have found relief from pain easily overbalance these objections."

"Finally, are there any untoward sequelæ chargeable to the radium account? Two are possible. First, does radiation produce pain shortly after the first or second sitting? Occasionally it does. In anticipation of this possibility, we warn the patient not to be alarmed should it occur, for in a small percentage of cases notwithstanding every care exercised in the protection of the rectum a very acute proctitis may follow. In such cases a decided stranguary may be noted at variable intervals from a few days to three or more weeks after radiation. Mucus and even blood may be discharged and the pain may be so severe as to require hypnotics. In some cases opium suppositories may be necessary to quiet the patient. In others a mucilaginous suspension of bismuth subnitrate by rectal injection may be quite sufficient to soothe the pain. In general, however, this symptom is the exception rather than the rule, and will be noted with increasing infrequency as precaution is observed in the protection of the rectum and bladder. Much less frequently is vesical tenesmus noted and, as a rule, it is of a more evanescent type."

"As to fistula we have noted 17—9 rectovaginal and 8 vesical. By no means should all of these fistulæ be charged to radium, for in over 200 cases of inoperable cancer which are not treated, certainly this terminal event will occur in a large number of patients. We are convinced, therefore, that such distressing phases of cancer of the cervix are actually prevented, for in the large number of cases which were locally healed of deep ulcerating cervical craters, there has been no further trouble in this locality, and in most of the patients who ultimately died the end came through metastasis or deep pelvic extension."

"Briefly stated, therefore, we see in the use of radium in inoperable cases of cancer a greater tendency to relieve pain than to produce it, and also a smaller percentage of fistulæ after its use than in the patients going to their death untreated, or in which various palliative operations are performed or the actual cautery is applied. Through the results achieved by radiation in this group of inoperable cases, the question is forced into the foreground—Shall we abandon the radical operation in all cases in favor of radiation? As yet, we may not wisely answer this question. Certainly the questionable operative case must be transferred to radium therapy. In the definitely operable case with a well circumscribed area and no broad ligament extension, we still advise hysterectomy."

# **RADIUM**

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TRY, PHYSICS AND THERAPHEUTICS OF RADIUM  
AND OTHER RADIO-ACTIVE S U B S T A N C E S

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tomy. We base this adherence to operation upon the certainty of a definite percentage of cures obtained through surgical intervention. On the other hand, the transfer of every questionable case to the group for radiation is based upon the certainty of a large surgical mortality in the event of an operation, the frequency of disabling sequelæ and the distressingly high percentage of recurrence after even the most radical operation."

"Thus far we know that radium greatly supplements surgery and within the next five years it may possibly supplant the radical operation in even the early cases."

"Finally, as to the question of operation after radium has apparently reduced the inoperable to an operable stage. Upon this issue we see no reason in favor of this plan. We feel convinced that surgery can accomplish nothing further in such cases. To the contrary, we believe that surgical intervention is most hazardous. The connective tissue contractions in the vaginal vault and parametrium incident to radiation must render the dangers of injury to the bladder, ureters and rectum greater, and the disruption of connective tissue which may actually have encapsulated the carcinoma may lead to a reimplantation of malignant cells, which may have been held in leash or actually have been rendered innocuous. On the other hand, in the actually operable cases we commend and now follow the plan advocated by Howard Taylor. He radiates all operable cases a few days before hysterectomy is performed. This appears most logical for the operation quickly follows before the actual destructive changes have taken place, and in his experience he finds no increase in the difficulty of a panhysterectomy. This, however, is a very different proposition from that offered after a deep crater has apparently been healed and upon its site dense hyalinized connective tissue has formed which drags the base of the bladder, ureters and rectum into close juxtaposition."

"From our summary of 209 cases we find no cause for discouragement, for we have seen splendid palliative results from radiation, and we think it possible that with a further development of technic, cancer of the cervix may be removed from the surgical domain. Should this transfer become feasible, we are sure we shall find few dissenters among surgeons, for certainly we have no grounds for optimism from a radical operation in the pathetically small percentage of operable cases. For every case which may with reason be submitted to operation at least ten will fall by the wayside because they apply for help too late. To these wretched sufferers radium offers a palliative boon and even a possibility of cure. In cancer of the fundus the results are too satisfactory to be abandoned in favor of radium, although in at least four cases we have witnessed a very favorable outcome in patients in whom there were grave contraindications to surgical measure. In two instances a cure appears to have been effected. For patients, therefore, suffering with complications prohibiting an operation, radiation offers a decided hope, for in no anatomic situation may we so certainly secure the full force of the radium without ill results. The force of the radiations is chiefly confined to the fundal cavity and the muscular uterine walls shield other organs from injury."

"Two years ago we presented a summary of results in 100 cases of inoperable cancer of the cervix and female genital organs treated in the Gynecological Department of the University Hospital, and arrived at the following conclusions:"

## RADIUM

"1. As a palliative remedy radium is the treatment par excellence in inoperable cases of cancer of the cervix.

"2. In border-line cases in which formerly we accepted the grave risks of an operation in the hope of eradicating the disease, we now employ radium, but in the certainly operable class we still advocate a radical operation followed by post-operative radiation.

"3. In cancer of the fundus, even when far advanced, we perform a hysterectomy, resorting to radiotherapy only in the fact of grave operative contraindications."

"In view of our further experience, we now feel that our fourth conclusion, as then set forth, may be modified by a limited claim for actual curability. It was as follows:"

"As yet we claim no cures, but, based upon the observation of a considerable number of inoperable cases which have remained locally healed from one to three years, we venture the hope that the quinquennial test will find several survivors."

\* \* \* \* \*

Hiram N. Vineberg, M.D. (New York). Myomectomy vs. Radium and X-Ray in the Treatment of Fibroid Tumors in Women under Forty Years of Age. *Medical Record*, xcix, Jan. 15, 1921.

"It seems to me the time is opportune for a discussion of the relative merits of myomectomy, and radium and x-ray, in the treatment of fibroid growths of the uterus in women who are still comparatively young, say, under forty."

"There is no claim made by me to adduce anything new about the operation of myomectomy. As is well known, it has been practiced for several years by most gynecologists and by some general surgeons; but the object of this short communication is to draw attention to what probably is not so well known, namely, that myomectomy is by far the more conservative procedure in women who have still some years to the menopause, than is either radium or the x-ray."

"In the first one, there is conservation of the menstrual function; in the other two (if they are successful) menstruation ceases and all the distressing phenomena of the artificial menopause appear."

"All of us who operate upon the genital organs of women learn early in our career to abate our joy at the successful issue of a radical operation, through the probable return of our patient afterwards, complaining of various nervous symptoms for which we can give them but little relief. In many instances there is no choice in the matter, as, for instance, in malignant disease and in hopelessly diseased adnexa leading to partial or complete invalidism."

"Therefore it is that the conscientious and thoughtful operator nowadays makes every effort to preserve the menstrual function of his patient. I say, advisedly, menstrual function, for the ovaries to my mind serve no useful purpose when the uterus has been removed, or when the endometrium has been destroyed so that menstruation is no longer possible."

"Some of the very worst cases of the artificial menopause syndrome have been witnessed by me in women who had their ovaries and their uterus in situ, but in whom a too energetic curettage had brought about a permanent cessation of menstruation. The same applies to instances when the uterus was removed and the ovaries left behind."

"There is to be observed at the present time a singular state of

mind on the part of medical men. They are all keenly alive to the importance of conserving the menstrual function in women. They hesitate, to their credit, to consign their patient to an operation which would destroy that function. Still, they will refer, without a moment's hesitation, a patient with a bleeding fibroid of the uterus, to the roentgenologist or radiologist, who can only be successful by destroying that function, and, in most instances, permanently."

"For this state of mind of the medical profession, the gynecologist himself is mostly to blame. He has written and talked to a surfeit-degree about the various techniques in performing hysterectomy;—whether the cervix should be removed or should not, or whether in removing the uterus an ovary should be left or not, and about kindred details. But on the true crux of the matter,—the conservation of the menstrual function,—he has been rather silent. It remained for that deep medical thinker and great surgeon, W. J. Mayo, to bring the subject recently before the profession in a masterful and convincing paper, read before the Obstetric Section of the American Medical Association at its meeting of April, 1920, and published in the *Journal of the American Medical Association* for June 19, 1920. The perusal of this paper gave me especial pleasure, in that it expressed the views that I have held and the practice I have followed for many years past."

"The statistics Mayo furnishes (and to no other operator are such huge personal statistics available) dispel the fear that myomectomy is a more dangerous operation than hysterectomy. In 617 cases of abdominal myomectomy in the Mayo Clinic, there were only three deaths, or 0.5 per cent."

"My own statistics are very modest in comparison but are equally good. For a period of about the past ten years I have been able to collect 120 cases, 31 from my own private patients, and 89 from the Second Gynecological Service of Mt. Sinai Hospital. There was not a single death among the entire series."

"In one of the hospital cases a hysterectomy was done shortly after the myomectomy, because the patient was running an elevated temperature, and an undetected sloughing submucous fibroid was found. This was among the early cases, when an exploration of the uterine cavity was not always practiced."

"In a second hospital case there was an extensive breaking-down of the abdominal wound, with evident secondary suppuration of the wound in the uterus, as the patient has a small uterine fistula which however gives promise of closing soon."

"This practically constituted all of the serious morbidity that occurred. The ages of the private patients ranged from 22 to 37 years. One was 42 years old. Nine, or 27.7 per cent. of the patients conceived afterwards. One had 2 children, seven had 1 child, and one resulted in interstitial pregnancy."

"Five of the patients were pregnant and had to be operated upon on account of acute symptoms due to degenerative changes in the growth. Two went to full term and gave birth to living children. In the remaining three the tumor invaded the uterine cavity to such an extent that after removal of the growth the uterine wound could not be coapted until the products of conception were removed."

"All but two of the cases were operated upon through the abdominal route. The tumors, with a few exceptions, were large, ranging from the size of the closed fist, to growths reaching to the umbilicus and to midway between the umbilicus and ensiform cartilage. They

were all interstitial or submucous. In none of the cases has there been a recurrence of fibroid growths or of menorrhagia."

"The subsequent histories of the hospital cases, for obvious reasons, are not so well known. The follow-up system is of comparatively recent date and is far from being thorough. None, however, have been readmitted for secondary operations and those who have returned to the follow-up clinic showed no recurrence of growths. On bimanual examination no appreciable enlargement of the uterus was noted. Three were pregnant at the time of operation; in one the uterus was emptied at the time of the myomectomy; the other two went to full term and were delivered of a living child. In one of the latter a dermoid cyst of the right ovary was also removed."

"Three of the patients, one of whom had been sterile before operation, conceived afterwards and went to full term with normal deliveries. Eight patients were operated upon through the vaginal route; the remaining eighty-one through an abdominal incision."

"It is a surprise to oneself what apparently unpromising cases lend themselves to a myomectomy if one starts out with the determination to save, if possible, the uterus in whole or in part. I recall several, in which at first sight the size and the number of the growths and their situation were such that a conservative operation did not seem at all feasible; still, with persistence and patience I was able to remove the growths and build up a fairly satisfactory uterus."

"Two of these cases are worthy of special mention: In one, the growth reached to three inches above the umbilicus and was situated between the fundus and the cervix. After its removal the body of the uterus was almost completely separated from the cervix, being united posteriorly by only a narrow bridge of tissue. I sutured the body to the cervix with plain catgut. The patient made a good recovery, menstruated normally and on examination a few months later the uterus felt like a perfectly normal organ. In the other, the growth, equally large, was situated in the same way, between the fundus and the cervix, but had also developed deeply and extensively into the layers of the broad ligament. When the growth was removed there was such a disturbance of the anatomic relations of the right tube and ovary that I deemed it wise to remove them, particularly as the left tube and ovary were perfectly normal."

"What the operation meant to these two patients can readily be realized when it is borne in mind that they were both unmarried women, 32 and 35 years old respectively, who had immediate prospects of marriage, provided their generative organs could be conserved."

"One of the objections often raised against myomectomy is the frequency with which tumors develop later, requiring a second operation. In Mayo's series of 741 cases, only 19 (1.56 per cent.) required secondary operations. In 11 of the cases the operation was performed five or more years after myomectomy, and in 1, thirteen years afterwards."

"We have seen that my own statistics in this respect, as far as they go, are even more favorable than those cited by Mayo. Thus far not a single case has had to be operated upon again although many of the patients were operated upon more than five years ago."

"I have had occasion more than a few times to do a second operation upon patients previously operated upon by other surgeons, but in these instances the period elapsed from the prior operation was so short, and the growths were so large, that the impression gained was that the prior operator had contented himself merely with removing the pedun-

culated growths and had left untouched the equally large or larger interstitial ones."

"A valuable point made by Mayo has reference to the advisability or necessity, in cases of hemorrhage, in addition to the myomectomy, of opening the uterine cavity and of thoroughly curetting the endometrium under the eye. In the majority of my cases this procedure was made unnecessary by one or other of the tumors dipping into the uterine cavity and being covered in great part directly by the endometrium. The difficulty in these cases was to conserve sufficient endometrium to carry on the function of menstruation."

"But the value of the procedure was forcibly illustrated in a case recently operated upon by me. The patient had had profuse hemorrhages for a long period so that her hemoglobin was reduced to 38 per cent. At the operation there was found a growth the size of the closed fist, situated in the posterior wall. There were three smaller ones scattered over the rest of the uterus. When all the growths had been enucleated and the resulting wounds sutured, the body of the uterus still appeared rather large. However, no other tumor could be felt through the uterine wall, by the most rigid palpation. Nevertheless, I felt that those that had been removed would scarcely have caused such severe hemorrhages. I therefore cut through the wall of the fundus directly into the cavity of the uterus, and found the endometrium very much thickened, and spongy, and detected an elongated submucous fibroid of the size of one's thumb. The latter was easily removed with the finger and the endometrium was thoroughly curetted under the eye."

"In spite of our strongest determination and most painstaking efforts, it must be admitted cases will now and then be encountered in which it is not possible to save the uterus. What we must endeavor to do, then, is to save enough of the organ and endometrium to carry on the function of menstruation."

"Even should we be baffled in this and the entire organ have to be sacrificed, the patient would in nowise be any worse off regarding her menstrual function than she would have been had she been successfully treated with x-ray or radium. On the contrary, to my mind she would be better off, for her cure would be more certain and more complete."

"Let me not be misunderstood. I am not endeavoring to make out a case against x-ray or radium, as the title of my paper might indicate. They have their uses in the treatment of fibroids, even in young women. There are certain women to whom the dread of an operation is so great that they will go on suffering pain and loss of blood rather than submit to it. Such patients I refer to the roentgenologist or radiologist; also those who have a constitutional dyscrasia which would render an operation unusually dangerous."

"I go even further. Every patient who consults me regarding a fibroid tumor causing symptoms, is told by me she may have her choice of treatment, either by operation, or by x-ray or radium. I tell her, regardless of her age, that the one (operation) perhaps carries more risk with it than do the others, but that in my opinion it is more certain of permanent cure. If she is under forty I try to impress her with the advantages, of which I myself am strongly convinced, of submitting to an operation, the endeavor of which would be to remove her tumor or tumors and preserve her menstrual function."

"Note—In the discussion, following the reading of the paper, exception was taken by Dr. Howard Taylor to the statement that operation carried with it more risk to life than x-ray or radium. He cited a

fatal case following radium treatment. I myself recall a fatal case in the hands of one of the most expert radiologists in the country. No doubt other deaths have occurred. This scarcely could be otherwise, in view of the fact of the uncertainty in the diagnosis of abdominal tumors. The most expert and experienced diagnosticians frequently make errors in this field. Cases not infrequently occur of old pus tubes so intimately baked to the uterus that the resulting mass is frequently mistaken for a fibroid tumor. Every operator will recall several such mistakes in his own experience. Ovarian cysts with thick walls and malignant growths of the uterus. X-ray or radium treatment in these instances would be disastrous. Numerous other conditions could be cited, did space permit, in which a diagnosis of a fibroid growth is made and on opening the abdomen an entirely different condition is found."

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Echlin S. Molyneux, M.R.C.S. (Leamington, Eng.) Two Cases of Carcinoma Alive Eight Years after Radium Treatment. *Brit. Med. Jour.* p. 548, Oct. 9, 1920.

"One hears a good deal about apparent cures of cases of carcinoma by radium, in reports written soon after the treatment has ended, but little of what happens to these patients afterwards. The following two cases were seen eight years and one month ago, and radium treatment was started almost immediately."

"Case I. In July, 1912, a man of 61 who had previously enjoyed excellent health, but was a heavy smoker and took alcohol fairly liberally, sent for me because he had noticed a swelling on the right side of his neck. He also complained that for some months he had had some irritation of the throat, and was continually expectorating small amounts. A hard indurated ulcer with everted edges, of about the size of a shilling, could be seen and felt below the right tonsil. The swelling in the neck was a large mass of hard and fixed lymphatic glands. He was seen by various surgeons in London and the provinces, and all agreed in the diagnosis of carcinoma of the pharynx, quite beyond operative interference."

"In spite of the poor results obtained by radium in cases of carcinoma of the pharynx, I determined to give it a trial. I started by giving two applications of radium a week from the outside of the neck, and continued till the skin could stand no more without risk of ulceration, when I lessened the amount of radiation. The whole side of his neck was radiated as far down as the clavicle. At the end of a month there was a decided improvement, both of the primary growth and of the glands."

"At the end of six months all signs of disease had completely disappeared. Notwithstanding this, I continued to apply radium about once a week with a few short intervals, when the patient or myself were away, for another six months. He had his last application in July, 1913. Since then he has had no signs whatever of any recurrence, and today, eight years after, at the age of 69, he is in excellent health, and able to lead a busy life."

"Case II. A lady, aged about 60, complained in July, 1912, of a swelling in her right breast. It presented the usual signs of scirrhus carcinoma, and was adherent to the pectoral fascia. There were hard glands in the right axilla, but the supraclavicular glands appeared normal. The right breast was amputated and the axilla cleared."

"A piece of the growth from the breast and the whole of the mass of glands and connective tissue removed from the axilla were sent for pathological investigation. The report was that the tumor was a scirrhous cancer, and that not only did the axillary glands exhibit signs of secondary infection, but the fat of the axilla also was largely permeated by cancer cells. It was apparent, therefore, that it was impossible for surgery to have removed the whole of the diseased structures, and as soon as the wound had completely healed started radium treatment. The whole of the axilla and right side of the chest was rayed, and this was repeated till the skin showed signs of intolerance. Treatment was not left off till July, 1913. During this time there were no signs of recurrence. In November, 1913, a small swelling appeared over one of the ribs near the scar, suspiciously like the commencement of a recurrence. Radium treatment was resumed forthwith, and the swelling soon subsided. I continued applying radium till May, 1914."

"She has remained free from symptoms till lately, when she complained of a cough, and I found rhonchi and rales over the chest, more marked on the right side, but no bronchial breathing. I also think I can detect some enlargement of the liver, but she is stout and the abdomen is difficult to examine. She is a sufferer from rheumatoid arthritis, and is too infirm from this to be willing to undertake a visit to have her chest x-rayed, so the diagnosis remains in doubt, but the signs are very suspicious of a recurrence in the lungs and liver."

"From the above notes I think it can be fairly claimed that Case 1 has probably been cured by radium, and Case 2 has to thank radium for eight years of life, though the chances are that she is after all going to succumb to carcinoma."

"If more observers would publish the late results of similar cases that they have been able to follow, it would much help our knowledge of this important subject."

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W. S. Lazarus-Barlow, M.D. (London). Effects of Exposure to Radium. *Brit. Med. Jour.* p. 664, Oct. 30, 1920.

"At a meeting of the Section of Pathology of the Royal Society of Medicine, held on October 19, the President, Professor W. S. Lazarus-Barlow, M.D., delivered an address upon "Some pathological effects of exposure to the gamma rays of 5 grams of radium bromide." The large quantity of radium in question had been entrusted to Professors Lazarus-Barlow and Russ and the late Mr. Cecil Lyster for experimental purposes at the Middlesex Hospital. The entire report will be presented, when completed, to the Medical Research Council, by whom the loan was made, and by whose courtesy the present interim communication was possible. For the results now brought before the Section Professor Lazarus-Barlow alone was responsible. They were derived, in the main, from the histological examination of 20 frogs, 28 rats, 15 rabbits, and 9 cats. The address was illustrated by macroscopic and microscopic specimens and by lantern slides."

"In respect of the lethal effects of gamma rays, it appeared that primary and secondary changes in the animal must be distinguished. A rat would die, if exposed continuously to the 5 grams, in about forty-eight hours, but he would also die about forty-two hours after an exposure of six hours. Making allowances for distance from the source of irradiation, the minimal lethal dose of gamma radiation from this quantity of radium for the rat was about six hours, for the rabbit nine to ten

hours. Marked changes were seen in the blood, notably a diminution in number of lymphocytes. This was to be correlated with the presence of much nuclear debris in lymphatic glands and spleen in cases killed immediately after exposure, and with a marked cellular deficiency in the same organs in animals that had survived some days. This disappearance of cells was associated with a measurable diminution in size of the spleen. Hence it was now necessary to add irradiation to pressure and to disuse, as a cause of atrophy. Erythrocytes also diminished in number, and haemorrhages occurred in gastric and intestinal mucosae and in bone marrow. To a large degree the blood changes in animals were reflected in man."

"In striated muscle a deposition of lipoid and loss of striation were sometimes noted, and a translucency of fibres was frequent. In unstriated muscle a vacuolation was not uncommon that generally affected the contractile material but also involved the nuclei. Cardiac muscle usually showed no change unless the exposure was very severe, but under this condition translucency of fibres, loss of striation, and great fragmentation might be found. In liver, nuclear and cytoplasmic changes were often present. The nuclei might be ghost-like, or represented by no more than a few granules of chromatin, and the cytoplasm might disappear almost entirely. The two conditions were apparently independent, and it was frequent—in liver of animals or in new growths of man after exposure to this high degree of gamma irradiation—to find the cells represented by a well marked cell membrane and a well marked nucleus, with a considerable space between the two. In kidney, the cells of the convoluted tubules were chiefly affected. In the cat—but in none of the other animals examined—the renal cells in this region were almost completely converted into lipoid, but the glomeruli and the cells of the conducting tubules showed no trace of lipoid. In the frog, the glomerulus seemed to be changed to the greatest extent. Over the gastro-intestinal tract there was widespread disintegration of the mucosa associated with pronounced formation of mucus. The disintegration concerned the duodenum, jejunum, and upper part of ileum in particular, and the increased formation of mucus concerned the colon and rectum, and, to some degree, also the stomach."

"Our knowledge of the effects of x-rays upon the generative system would lead to the supposition that testicle and ovary would be profoundly affected by the large degree of irradiation in question. In point of fact this was not the case. There was an arrest of spermatogenesis and some impaired staining of spermatozoal heads in the male; and, in the female, the primordial ovules and Graafian follicles appeared to be the seat of a change resembling coagulation necrosis. But these effects were not associated with pronounced histological features. Probably the explanation lay in the relatively short survival of animals that underwent a prolonged exposure to the 5 grams of radium bromide."

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M. Bertolotti. Radiumtherapy of Tumors of the Hypophysis with Acromegaly. *La Rad. Med.* vi. p. 315, 1919. Abstr. in *Arch. of Rad. and Electr.* p. 254, Jan. 1921.

"A number of cases have now been treated by radiation with some favorable results, and a notable improvement in several. As there is great variation in the symptoms according to the position of the tumor this may account for the variation in results of treatment and the negative results of x-ray therapy in some cases. In dystrophy from tumor of the hypophysis the author's own results have been unfavorable. Simi-

larly, the clinical results of all tumors are varied—and the course of the disease may be from two to fifty years. In benign cases x-rays are advisable and useful—the detractors of x-rays say the improvement is a natural retrogression, but this is of short duration, whereas the x-ray improvement lasts longer. The best results are obtained in early cases, and as cystic degeneration follows in acromegaly the x-rays should be applied before this sets in. The author gives the history of a case treated by the gamma rays of radium from the early days. The first symptoms were seen in May, 1917, and by December the condition was already far advanced—vision nearly gone, impotency, asthenia, etc.—so that an adenoma or adenocarcinoma of the pituitary was suspected, most probably of the anterior lobe, and of rapid and malignant development. A course of intensive radium treatment was begun, but by March, after two treatments, the patient was worse instead of better, and the conditions seemed desperate. Not till July was there a slight improvement, when the vision of the left eye began to increase. Continuous but slow progress was made, and in September the radiograph showed surprising improvement in the profile of the sella turgica. By the following December, 1918, the vision had so recovered that he was able to resume his work as a designer, and all the symptoms had disappeared. This result was obtained solely by massive doses of radium applied bitemporally, and neither the intra-buccal nor the intra-nasal method was necessary. It follows that the gamma rays are efficient at a distance of more than 10 cm. through tissues, and have probably an elective action on certain neoplastic cellular elements.”

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Russell H. Boggs, M.D. (Pittsburgh). The Treatment of Carcinoma of the Breast by Imbedding Radium Supplemented by X-Ray. *Am. Jour. Roent.* viii, 20-24, Jan., 1921.

“In all the progress made in recent years in radiotherapy, nothing has been evolved of such significant import in the treatment of carcinoma of the breast, as the advanced method of imbedding radium, with its manifold and varied advantages and possibilities in deep therapy. By imbedding radium throughout the entire breast, in the axilla, into the glands leading from the breast to the axilla and into the glands below the clavicle, it is now possible to make radiation for carcinoma of the breast as thorough as a radical dissection without opening the lymph channels. Supplementing Coolidge x-ray treatment to the twenty or more lymphatic chains draining the breast, using 10 mm. of aluminum and cross-firing as much as possible, there is completed the most advanced and most effective treatment, which is in marked contrast to the treatment given fifteen or twenty years ago with a comparatively low penetrating gas tube, using no filtration or meters for giving exact dosage, and thus administering only superficial radiation when deep treatment was necessary.”

“Radiation for the treatment of carcinoma of the breast has been so changed by imbedding radium that where only superficial skin effects were formerly produced, now cancerous tissue deeper than that which can be removed by the knife can be destroyed without opening the lymphatic chains. Before embedding radium I always give surface applications in the axilla and over the glands below the clavicle, and I give a complete course of heavy filtered x-ray treatment to the breast and all the glands draining it. This checks cell proliferation and lessens the danger of metastases when the breast and adjacent lymphatics are

spear and radium inserted. It is generally agreed that it requires from two to four weeks to check cell proliferation. It has been shown that the lymphatics begin to undergo a fibrosis at the end of the fourth week and that the caliber of the lymphatic vessels is smaller than before treatment was given. It seems just advisable to give surface treatment before imbedding radium as before operation. Some few surgeons are now advising ante-operative treatment, and if they would include imbedding radium and remove less tissue, thereby leaving the sclerosed lymphatic tissue as a barrier against cancer cells, I feel sure that the end results would be better, at least in borderline cases; that is, there would be fewer recurrences, and if a recurrence did take place it would be considerably later than when the operation precedes radiation."

"Imbedding radium in the treatment of carcinoma of the breast is a step in advance, but the number of cases treated by this method is not sufficient and its use is of too short duration to speak about anything but temporary results. Even in some of the advanced cases the disease in the breast and the glands appears to have retrogressed, clinically. Of course in some cases there is still thickening due to the fibrosis from the radiation. Not enough cases have been operated upon to give definite histological changes. In the inoperable cases we were inclined to leave well enough alone, and in the early cases each one has refused operation. My advice has been, even in the advanced cases, where the disease has clinically receded, to have the breast removed without opening the axilla; but to my extreme disappointment, in almost every advanced case that I turned over to the surgeon he opened the axilla, and when the patient returned, almost without exception she had a swollen arm and was in much worse condition than before operation. I feel sure, however, that if we could have the surgeon remove only the breast, thereby taking away the unhealthy mammary gland, the patient would be greatly benefited. I am speaking of the advanced or inoperable cases which have had thorough radiation, and not the early cases which we are advising to have ante-operative radiation. Imbedding radium as described takes the place of operation in advanced cases, and as before stated, the removal of the breast is all that is advised."

"The method I have adopted is to give a thorough course of Coolidge x-ray treatment to all the glands draining the breast, using the following equation: 10 mm. aluminum, 8 inch tube distance, five milliamperes of current, nine inch spark-gap and from fifteen to twenty minutes exposure. A constant voltage is difficult to obtain. The pastille erythema dose is very unreliable and is not as accurate as the milliampere dose, using the different types of transformers with a fluctuating voltage. Calculations based upon false assumptions have been very misleading, and in giving a lethal dose exact standards must be employed. In many of the cases the breast and axilla receive a maximum dose from radium packs before imbedding radium.

"Two or four weeks after surface applications I have been imbedding 10 mg. radium needles (vanadium steel needles, thickness of wall .35), placing them 1 cm. apart, and giving from five to eight hours' exposure. In some cases this produced a slight inflammatory reaction, but in no case has necrosis taken place. I may say that I started over three years ago—most reluctantly—to imbed radium in more superficial lesions; I can now indorse this technique as presenting many points of advantage over surface application in the treatment of many forms of malignant lesions, but it will not take the place of the Coolidge x-ray tube in the treatment of distant and deep metastases."

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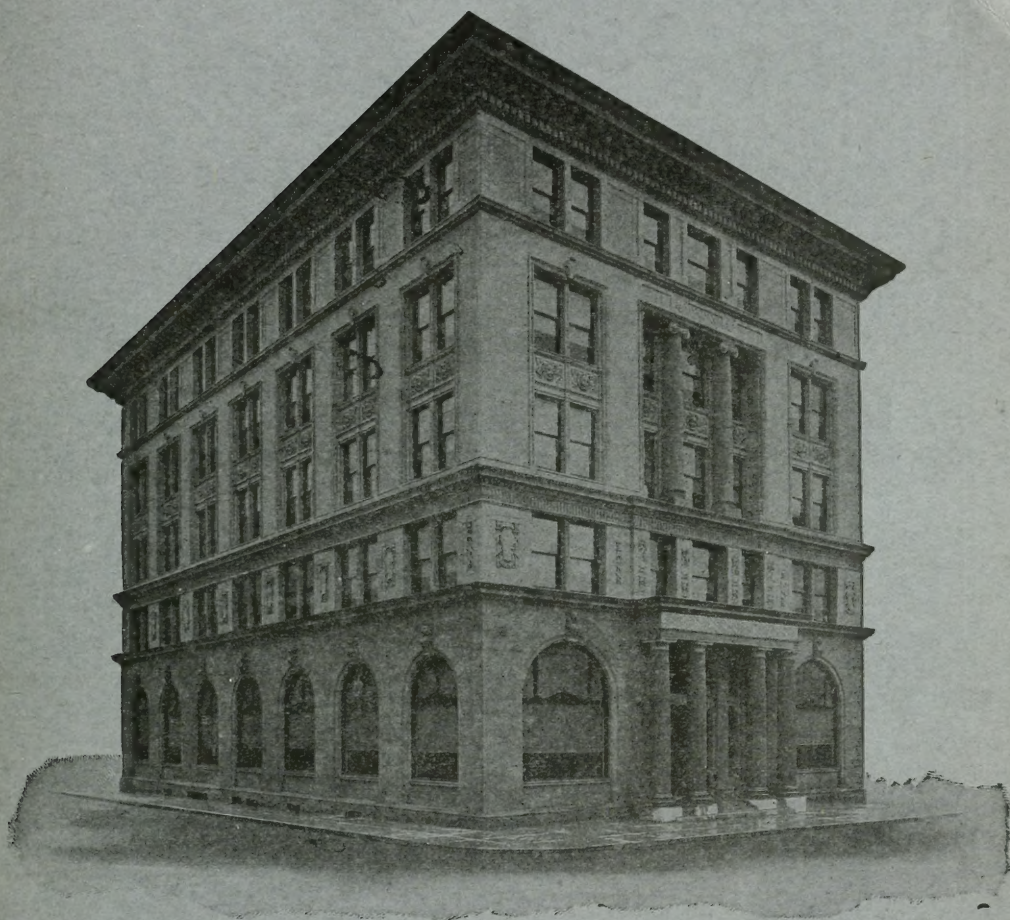
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